

# PATENT ABSTRACTS OF JAPAN

(11)Publication number :

11-069241

(43)Date of publication of application : 09.03.1999

---

(51)Int.CI.

H04N 5/335

H01L 25/065

H01L 25/07

H01L 25/18

H01L 27/14

---

(21)Application number : 09-229513

(71)Applicant : SANYO ELECTRIC CO LTD

(22)Date of filing : 26.08.1997

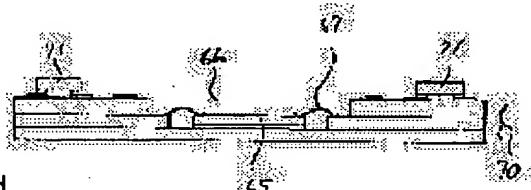
(72)Inventor : NARUSE TOSHIMICHI  
SAKAI NORIHIRO

---

## (54) SOLID-STATE IMAGE-PICKUP DEVICE AND ITS MANUFACTURE

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To easily solder a circuit element to a mounted substrate by forming a mounted substrate corresponding to the mounted area of an LCC package and mounting a semiconductor bare chip in this groove, so as to reduce the size of the mounted substrate and to realize a surface without projections from a mounted substrate surface.



**SOLUTION:** A groove 66 is formed at the mounted substrate 70, consisting of multilayered wirings and provided with an electrode for sticking the circuit element to connect a bare chip 65 to this groove 66. Electrodes on the surface of the chip and that exposed at the groove 66 are electrically connected through a metallic thin line 67 to constitute the circuit of the mounted substrate.

Eutectic soldering is screen-printed to the surface of the mounting bare chip 65, and the circuit element is mounted onto this to solder at re-flowing furnace. Succeedingly, the substrate is turned over to screen-print low-melting point soldering and this circuit element 71 is mounted onto this for soldering at a soldering reflow furnace. In addition, the substrate 70 is turned over yet once more and the package 53 is mounted.

---

## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of  
rejection]

[Date of requesting appeal against examiner's  
decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

\* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

---

CLAIMS

---

[Claim(s)]

[Claim 1] The sensor chip which accumulates the information charge which two or more light-receiving pixels are arranged in the shape of a matrix, and produce by photo electric conversion in each light-receiving pixel, The LCC package with which two or more leads which one depression section is equipped with said sensor chip, and are electrically connected with the electrode of said sensor chip extended to the base located outside from the depression section around said sensor chip, The mounting substrate which is electrically connected with the sensor of said LCC package, and mounts this LCC package, The solid state camera characterized by having the lens unit by which the light-receiving side of said sensor chip was equipped with the lens which carries out image formation of the image, forming a slot in said mounting substrate corresponding to the mounting field of said LCC package, and mounting the bare chip of a semi-conductor in this slot.

[Claim 2] The sensor chip which accumulates the information charge which two or more light-receiving pixels are arranged in the shape of a matrix, and produce by photo electric conversion in each light-receiving pixel, The LCC package with which two or more leads which one depression section is equipped with said sensor chip, and are electrically connected with the electrode of said sensor chip extended to the base located outside from the depression section around said sensor chip, The mounting substrate which is electrically connected with the sensor of said LCC package, and mounts this LCC package, It has the lens unit by which the light-receiving side of said sensor chip was equipped with the lens which carries out image formation of the image. Fixing with said LCC package and said mounting substrate The solid state camera characterized by forming a slot in inter-electrode [ of the mounting substrate with which it becomes with a cold cure type silver paste, and a silver paste is applied ].

[Claim 3] The mounting substrate with which the slot which can hold a component in one [ at least ] field was formed is prepared. So that the bare chip for the drive of a sensor chip is mounted in the slot of this mounting substrate, wire bond of the electrode on the front face of a bare chip and the electrode in the groove bottom section is carried out, solder fixing of the circuit element may be carried out after this at a mounting substrate and the slot of said mounting substrate may be covered The manufacture approach of the solid state camera characterized by preparing the LCC package with which said sensor chip was mounted.

---

[Translation done.]

\* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.\*\*\*\* shows the word which can not be translated.

3.In the drawings, any words are not translated.

## DETAILED DESCRIPTION

---

### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the solid state camera which dedicated the CCD chip to the LCC package, and its manufacture approach.

[0002]

[Description of the Prior Art] Since the solid state camera which consists of a semi-conductor like CCD series needs to copy a photographic subject image on the front face of a sensor chip, opening is formed corresponding to the light-receiving side of a semiconductor chip. For this reason, in the case of a solid state image sensor, more ceramic packages which are easy to form opening than before are used.

[0003] Drawing 7 is a solid state camera carried by JP,9-55487,A, and a ceramic package (LCC package) is used for it. Two or more light-receiving pixels and shift registers are formed of a well-known semi-conductor process on a silicon substrate, and the sensor chip 11 has the light-receiving side 12 where two or more light-receiving pixels were arranged in the shape of a matrix. The bottom member 13 consists of insulating materials, such as a glass epoxy group plate and a ceramic substrate, and the central part of one field is equipped with the sensor chip 11. Moreover, two or more leads 14 which extend from the periphery of the stowed position of the sensor chip 11 to a side part are formed with electrical conducting materials, such as copper foil. These leads 14 of two or more are connected by the electrode pad and wirebonding by which the edge by the side of a center section is formed in the circumference part of the sensor chip 11 as an input/output terminal. Moreover, the locating hole 15 of a pair is formed inside [ which the bottom member 13 counters ] two sides. The opening 17 for the frame part material 16 being formed in the same magnitude with the same ingredient as the bottom member 13, and forming the crevice which dedicates the sensor chip 11 to a center section is formed. The locating hole 18 is formed inside [ which this frame part material 16 counters ] two sides as well as the bottom member 13. This bottom member 13 is stuck on the bottom of the frame part material 16, it dents in the opening 17 of the bottom member 13 and the frame part material 16, and the section is formed. Moreover, if the bottom member 13 and the frame part material 16 are stuck, the configuration by which the electrode connected to lead 14 was formed in those side faces as a broken line showed to drawing 1 will be taken. Thereby, the LCC package of a surface mount mold is formed. In addition, lamination of the bottom member 13 and the frame part material 16 is previously performed rather than it equips the bottom member 13 with the sensor chip 11, and after formation of the locating hole 15 of the bottom member 13 and the locating hole 18 of the frame part material 16 sticks the bottom member 13 and the frame part material 16, it is made to perform it to coincidence. As the transparency plate 19 consists of a transparent ingredient to the lights, such as acrylic resin, and straddles two sides which the opening 17 of the frame part material 16 counters, the front face of the frame part material 16 is equipped with it. This transparency plate 19 is formed shorter than width of face of two sides in which the die length of one side is formed for a long time than width of face of two sides which one side of opening 17 counters and which the die length of the side of another side counters in another side of opening 17. It means that a part of opening 17 opened it with as by this when it equipped with the transparency plate 19 so that it might straddle between two sides which opening 17 counters. Here, it is equipped with it as the transparency plate 19 is wearing the light-receiving side 12 of the sensor chip 11 at least. And it fills up with transparency resin with almost same transparency plate 19 and refractive index between the sensor chip 11 and the transparency plate 19, and the sensor chip 11 and wiring are protected.

[0004] The LCC package with which this sensor was mounted is mounted in a printed circuit board or a ceramic substrate, and is electrically connected and mounted by the camera for computers, the electronic camera, etc.

[0005]

[Problem(s) to be Solved by the Invention] However, as for the mounting substrate with which an LCC package is mounted, circuit elements, such as a chip resistor and a chip capacitor, are mounted in both sides through solder for the purpose of the miniaturization of a solid state camera. However, since the drive IC of a sensor chip was mounted in a mounting substrate, there was a problem that a miniaturization was difficult. Moreover, it connected by the bonding wire, and since, as for the perimeter of a bonding pad, the tooth space was provided, Drive IC was making the hindrance of a miniaturization further, so that a bonding tool could reach a mounting substrate.

[0006]

[Means for Solving the Problem] The solid state camera of this invention is solved by forming a slot in the mounting substrate corresponding to the mounting field of an LCC package, and mounting a semi-conductor bare chip in it in this slot the 1st. Since a bare chip can be mounted in a slot, and size of the part mounting substrate can be made small and it is included in the bare chip fang furrow, a front face without elutriation can be realized from a mounting substrate front face, and a circuit element can be soldered to a mounting substrate.

[0007] A slot is formed and solved to inter-electrode [ of the mounting substrate with which fixing with an LCC package and said mounting substrate is accomplished to the 2nd with a cold cure type silver paste, and a silver paste is applied to it ]. That is, before desiccation solidification, since viscosity is low, a silver paste may spread the surroundings of an electrode, each may short-circuit, but since a slot is formed in inter-electrode, the paste which spreads in a longitudinal direction can be made to be able to face to the side attachment wall of the lengthwise direction of a slot, and a short circuit can be controlled.

[0008] The mounting substrate with which the slot which can hold [ 3rd ] a component in one [ at least ] field was formed is prepared. So that the drive IC of a sensor chip is mounted in the slot of this mounting substrate, wire bond of the electrode of a sensor chip front face and the electrode in the groove bottom section is carried out, solder fixing of the circuit element may be carried out after this at a mounting substrate and the slot of said mounting substrate may be covered It solves by preparing the LCC package with which said sensor chip was mounted.

[0009] It has an acute angle corner by the bonding head and the wire feed zone, this is united, and a bonding tool approaches to a bonding pad in fixed height. Therefore, although bonding cannot be carried out if the circuit element on a mounting substrate is on the locus or a circuit element is in a wire or its feed zone, since a bare chip is mounted first, the problem is lost, and it is \*\*.

[0010]

[Embodiment of the Invention] Drawing 1 is the decomposition perspective view showing the structure of the solid state camera of this invention. Two or more light-receiving pixels and shift registers are formed of a well-known semi-conductor process on a silicon substrate, and the sensor chip 51 has the light-receiving side 52 where two or more light-receiving pixels were arranged in the shape of a matrix.

[0011] A sign 53 is an LCC package which mounts said sensor chip 51, and two frame part material of drawing 7 is used. That is, it dents in the bottom member 54, the 1st frame part material 55, and the 2nd frame part material 56, and the section is formed. Although these elements can consider a ceramic substrate, a printed circuit board, etc., they are carried forward below by the ceramic substrate here.

[0012] The bottom member 53 consists of an insulating material of a ceramic substrate, and the central part of one field is equipped with the sensor chip 51. Moreover, the 1st opening 57 including the perimeter of the sensor chip 51 is formed in the 1st frame part material 55, and the 2nd bigger opening than this 1st opening is prepared in the 2nd frame part material. Therefore, the inside of the 1st frame part material 55 is exposed, and two or more leads 58 which extend to the circumference are formed here with electrical conducting materials, such as copper foil. These leads 58 of two or more are connected by the electrode pad and wirebonding by which the edge by the side of a center section is formed in the circumference part of the sensor chip 51 as an input/output terminal. Moreover, the height of a sensor chip and the 1st frame part material 55 is formed almost equally, and makes bonding nature of a bonder good. Moreover, a slot is formed in the side face of a package in which the bottom

member 53 and the frame part material 55 and 56 were stuck, and the electrode which was electrically connected with said lead 58 and extended at the rear face of a bottom member is prepared in it.

[0013] Inside [ which the frame part material 56 counters ] two sides, alignment is carried out to the heights which the locating hole 60 of a pair was formed and were formed in the interior of the sensor unit 61. Although omitted in the drawing, as a transparence plate (it is a transparent ingredient to the lights, such as acrylic resin) straddles two sides which the opening 62 of the frame part material 56 counters, the front face of the frame part material 56 is equipped with it. This transparence plate is formed shorter than width of face of two sides in which the die length of one side is formed for a long time than width of face of two sides which one side of opening 62 counters and which the die length of the side of another side counters in another side of opening 62. While this equips with a transparence plate so that it may straddle between two sides which opening 62 counters, it considers as the condition of having opened a part of opening 17. And it filled up with transparence resin with almost same transparence plate and refractive index between the sensor chip 51 and the transparence plate, and the sensor chip 51 grade is protected.

[0014] Here, the transparence resin with which it fills up between the sensor chip 51 and a transparence plate is filled up with an actual production process so that the crevice formed by the opening 62 of the frame part material 56 immediately after equipping the bottom member 54 with the sensor chip 51 may be filled. And before transparence resin hardens, as it straddles, it is equipped between two sides which opening 62 counters. When there is much transparence resin with which it fills up, in order to rise by this in the part which is not covered with the transparence plate of opening 62, the relief of a transparence plate is not produced. On the contrary, since a crater is generated in the part which is not covered with the transparence plate of opening 62 when there is little transparence resin with which it fills up, air bubbles do not mix between the light-receiving side 52 of the sensor chip 51, and a transparence plate.

[0015] Above, although it is easy, the LCC package 53 is completed. In parallel to this, the slot 66 which can incorporate a bare chip 65 to the mounting substrate 70 is formed, and this slot is filled up with resin by the need. Are [ of this invention ] just going to be characterized by this slot, and it is later mentioned about this. The chip resistor 71, the chip capacitor 72, the semiconductor IC (here the drive IC 73 of a sensor), Connector C, etc. are mounted in both sides like drawing 2 in the mounting substrate 70 of this configuration. The LCC package 53 has fixed with the low-temperature type curing agent to one of this field by which double-sided mounting was carried out. Here, the silver paste 81 hardened 135 degrees in 1 hour is applied to the electrode of an LCC package, and the electrode 80 prepared in the corresponding place.

[0016] Furthermore, it has the form where the LCC package 53, the circuit element, etc. were constructed and crowded to the space which the sensor unit 61 into which the lens was built was assembled by the mounting substrate 70 and one, and was exactly shown by the dotted line so that image formation of the image may be carried out to the light-receiving field 52. Here, the silver paste with which an LCC package fixes with a mounting substrate and cold cure type electroconductive glue, and is hardened low-temperature 135 degrees as adhesives in 1 hour is used. That is, thermal degradation of the sensor chip 51 is also suppressed, and the solder of the mounting substrate 70 melts, and a curing agent with which the circuit element mounted in the field mounted IC73 does not fall is chosen the rear face of a mounting substrate, and here.

[0017] Then, the manufacture approach is explained briefly. First, like drawing 3, it changes with a multilayer interconnection, a slot 66 is formed in the mounting substrate 70 with which the electrode which a circuit element fixes was prepared, and a bare chip 65 is connected to this slot. The metal thin line 67 connects electrically the electrode on the front face of a chip, and the electrode exposed to a slot, and constitutes the circuit of a mounting substrate. And the eutectic solder of 183 degrees is screen-stenciled by the front face on which the bare chip 65 is mounted, a circuit element is mounted on this, and it is soldered to it at a solder reflow furnace.

[0018] Then, like drawing 4, a mounting substrate is reversed, the low melting point solder of 150 degrees is screen-stenciled, a circuit element is mounted on this, and it is soldered at a solder reflow

furnace. Rather than the solder with which the solder of a field which has turned to the bottom at this time was soldered previously, since it is high-melting, there is no fall of circuit elements 71 and 72. Furthermore, like drawing 5, the mounting substrate 70 is reversed again and the LCC package 53 is mounted.

[0019] As explained above, by formation of a slot 66, the mounting effectiveness of a mounting substrate can be raised and the miniaturization of a mounting substrate can be realized. Moreover, in order to carry out wire bond of the bare chip first, the locus of a bonding tool has little constraint. That is, since the circuit element is not mounted in the substrate by the side of mounting, a bonding tool does not reach a circuit element.

[0020] Moreover, the low melting point solder of about 150 degrees is used for the inferior surface of tongue by the top face of drawing 2 using high-melting solder rather than the opposite field of 183 degrees. therefore, silver paste solidification of 1 hour performs the drying furnace of a silver paste 135 degrees — having — both solder — \*\*\*\*\* — the LCC package 53 can be fixed without things.

Moreover, structure like drawing 6 may be adopted. This drawing wets the electrode pattern 80 shown in the mounting substrate of drawing 1, and is prepared 4 side side here. However, you may prepare 2 side side like drawing 1. Here, the silver paste 81 is applied and the LCC package 53 is arranged on an electrode 80. However, temporary fixing is also taken into consideration and pressed, a silver paste may begin to leak among electrodes 80 and 80, and, as a result, an LCC package becomes a short cause. By this invention, by adjusting and designing the die length of the lengthwise direction of a slot, the slot 82 on some was formed in the part shown with a point, and as it flowed to the lengthwise direction of a silver paste fang furrow, lateral breadth was controlled, and short-circuit is prevented.

[0021]

[Effect of the Invention] According to this invention, a slot is formed in the mounting substrate corresponding to the mounting field of an LCC package, and the mounting effectiveness of a mounting substrate is raised by mounting a semi-conductor bare chip in this slot to it, and the contact to the bare chip under conveyance can be prevented to it the 1st. A slot can be formed in inter-electrode [ of the mounting substrate with which fixing with an LCC package and said mounting substrate is accomplished to the 2nd with a cold cure type silver paste, and a silver paste is applied to it ], the paste which spreads in a longitudinal direction can be made to be able to face to the side attachment wall of the lengthwise direction of a slot, and a short circuit can be controlled.

[0022] The mounting substrate with which the slot which can hold [ 3rd ] a component in one [ at least ] field was formed is prepared. So that the drive IC of a sensor chip is mounted in the slot of this mounting substrate, wire bond of the electrode of a sensor chip front face and the electrode in the groove bottom section is carried out, solder fixing of the circuit element may be carried out after this at a mounting substrate and the slot of said mounting substrate may be covered By preparing the LCC package with which said sensor chip was mounted, the locus of the head of a bonding tool can be taken comparatively freely, and workability can be raised.

---

[Translation done.]

\* NOTICES \*

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
- 2.\*\*\*\* shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

---

## DESCRIPTION OF DRAWINGS

---

[Brief Description of the Drawings]

[Drawing 1] It is the decomposition perspective view showing the structure of the solid state camera of this invention.

[Drawing 2] It is the sectional view showing the structure of the solid state camera of this invention.

[Drawing 3] It is a sectional view explaining the manufacture approach of the solid state camera of this invention.

[Drawing 4] It is a sectional view explaining the manufacture approach of the solid state camera of this invention.

[Drawing 5] It is a sectional view explaining the manufacture approach of the solid state camera of this invention.

[Drawing 6] It is a top view explaining the mounting substrate of this invention.

[Drawing 7] It is a decomposition perspective view explaining the mounting approach of the conventional solid state camera.

---

[Translation done.]

(19) 日本国特許庁 (JP)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平11-69241

(43) 公開日 平成11年(1999)3月9日

(51) Int.Cl.<sup>6</sup>  
H 04 N 5/335  
H 01 L 25/065  
25/07  
25/18  
27/14

識別記号

F I  
H 04 N 5/335  
H 01 L 25/08  
27/14

V  
Z  
D

審査請求 未請求 請求項の数3 OL (全 6 頁)

(21) 出願番号 特願平9-229513

(22) 出願日 平成9年(1997)8月26日

(71) 出願人 000001889

三洋電機株式会社

大阪府守口市京阪本通2丁目5番5号

(72) 発明者 成瀬 俊道

大阪府守口市京阪本通2丁目5番5号 三  
洋電機株式会社内

(72) 発明者 酒井 紀泰

大阪府守口市京阪本通2丁目5番5号 三  
洋電機株式会社内

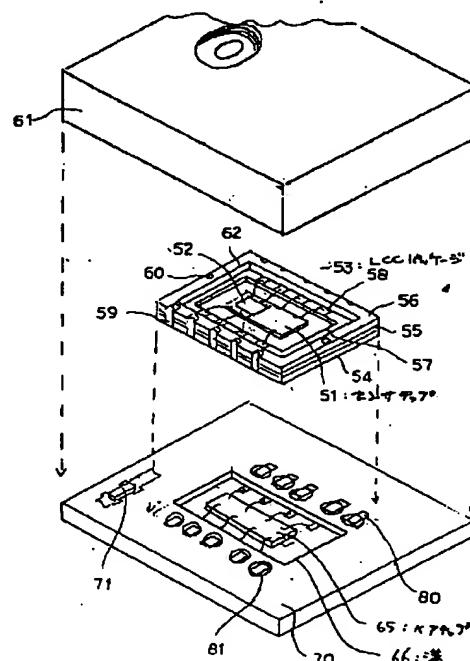
(74) 代理人 弁理士 安富 耕二 (外1名)

(54) 【発明の名称】 固体撮像装置およびその製造方法

(57) 【要約】

【課題】 LCCパッケージを用いた固体撮像装置は、中に耐熱温度の厳しいCCDチップが装着され、LCCを半田接着すると、センサの劣化が発生する問題があった。またその駆動用のICが実装基板にペアで実装されているが、ボンディングツールの制約により、実装基板のサイズを大きくしていた。

【解決手段】 実装基板70には溝66を形成し、その中に駆動用のペアチップIC65を固着し、その上にLCCパッケージ53を実装する。



(2)

1

### 【特許請求の範囲】

【請求項1】 複数の受光画素がマトリクス状に配列され、各受光画素に光電変換によって生じる情報電荷を蓄積するセンサチップと、

一方の凹み部に前記センサチップが装着され、前記センサチップの電極と電気的に接続される複数のリードが前記センサチップの周囲の凹み部から外側に位置する底面まで延在されたLCCパッケージと、

前記LCCパッケージのセンサと電気的に接続され、このLCCパッケージを実装する実装基板と、

前記センサチップの受光面に映像を結像するレンズが装着されたレンズユニットとを有し、

前記LCCパッケージの実装領域に対応する前記実装基板には、溝が形成され、この溝に半導体のベアチップが実装されることを特徴とした固体撮像装置。

【請求項2】 複数の受光画素がマトリクス状に配列され、各受光画素に光電変換によって生じる情報電荷を蓄積するセンサチップと、

一方の凹み部に前記センサチップが装着され、前記センサチップの電極と電気的に接続される複数のリードが前記センサチップの周囲の凹み部から外側に位置する底面まで延在されたLCCパッケージと、

前記LCCパッケージのセンサと電気的に接続され、このLCCパッケージを実装する実装基板と、

前記センサチップの受光面に映像を結像するレンズが装着されたレンズユニットとを有し、

前記LCCパッケージと前記実装基板との固着は、低温硬化タイプの銀ペーストでなり、銀ペーストが塗布される実装基板の電極間には溝が形成されることを特徴とした固体撮像装置。

【請求項3】 少なくとも一方の面に素子が収容できる溝が形成された実装基板を用意し、

この実装基板の溝の中にセンサチップの駆動用のベアチップを実装し、ベアチップ表面の電極と溝底部にある電極とをワイヤボンドし、

この後、実装基板に回路素子を半田固着し、前記実装基板の溝を覆うように、前記センサチップが実装されたLCCパッケージを設けることを特徴とした固体撮像装置の製造方法。

### 【発明の詳細な説明】

#### 【0001】

【発明の属する技術分野】 本発明は、LCCパッケージにCCDチップを納めた固体撮像装置およびその製造方法に関するものである。

#### 【0002】

【従来の技術】 CCDイメージセンサの如き半導体からなる固体撮像装置は、センサチップの表面に被写体映像を写す必要があるため、半導体チップの受光面に対応して開口部が形成される。このため、固体撮像素子の場合には、開口部を形成し易いセラミックパッケージが従来

50 【0005】

2

より多く用いられる。

【0003】 図7は、特開平9-55487号公報に掲載されている固体撮像装置であり、セラミックパッケージ(LCCパッケージ)を用いたものである。センサチップ11は、シリコン基板上に周知の半導体プロセスによって複数の受光画素及びシフトレジスタが形成されたものであり、複数の受光画素がマトリクス状に配列された受光面12を有する。底部材13は、ガラスエポキシ基板やセラミック基板等の絶縁材料からなり、一方の面の中央部分にセンサチップ11が装着される。また、センサチップ11の装着位置の周辺部から側辺部まで延在する複数のリード14が銅箔等の導電材料によって形成される。この複数のリード14は、中央部側の端部がセンサチップ11の周辺部分に入出力端子として形成される電極パッドとワイヤボンディングにより接続される。また、底部材13の対向する2辺の内側には、一对の位置決め穴15が形成される。枠部材16は、底部材13と同一材料で同一の大きさに形成され、中央部にセンサチップ11を納める凹部を形成するための開口部17が形成される。この枠部材16の対向する2辺の内側にも、底部材13と同様に位置決め穴18が形成されている。この底部材13が、枠部材16下に貼り合わせられ、底部材13と枠部材16の開口部17とで凹み部が形成される。また、底部材13と枠部材16とが貼り合わせられると、それらの側面には、図1に破線で示すように、リード14に接続される電極が形成された構成を取る。これにより、表面実装型のLCCパッケージが形成される。尚、底部材13と枠部材16との貼り合わせは、底部材13にセンサチップ11を装着するよりも先进に行い、底部材13の位置決め穴15及び枠部材16の位置決め穴18の形成は、底部材13と枠部材16とを貼り合わせた後に同時にを行うようとする。透明板19は、アクリル樹脂等の可視光に対して透明な材料からなり、枠部材16の開口部17の対向する2辺に跨るようにして枠部材16の表面に装着される。この透明板19は、一方の辺の長さが、開口部17の一方の対向する2辺の幅より長く形成され、且つ、他方の辺の長さが、開口部17の他方の対向する2辺の幅より短く形成される。これにより、透明板19を開口部17の対向する2辺の間に跨るように装着すると、開口部17の一部が開けたままとなる。ここで、透明板19は、少なくともセンサチップ11の受光面12を被うようにして装着される。そして、センサチップ11と透明板19との間には、透明板19と屈折率がほぼ同一の透明樹脂が充填され、センサチップ11及び配線が保護される。

【0004】 このセンサが実装されたLCCパッケージは、プリント基板やセラミック基板に実装され、コンピューター用のカメラ、電子カメラ等に電気的に接続・実装される。

(3)

3

【発明が解決しようとする課題】しかしLCCパッケージが実装される実装基板は、固体撮像装置の小型化を目的としてチップ抵抗やチップコンデンサ等の回路素子が半田を介して両面に実装されている。しかしセンサチップの駆動ICも実装基板に実装されるため、小型化が難しい問題があった。また駆動ICは、ボンディングワイヤで接続され、ボンディングツールが実装基板に到達できるように、ボンディングパッドの周囲は、スペースが設けられているため、更に小型化の妨げを作っていた。

#### 【0006】

【課題を解決するための手段】本発明の固体撮像装置は、第1に、LCCパッケージの実装領域に対応する実装基板に、溝を形成し、この溝に半導体ペアチップを実装することで解決するものである。溝にペアチップを実装できるため、その分実装基板のサイズを小さくでき、且つペアチップが溝に組み込まれているので、実装基板表面から飛び出しのない表面を実現でき、実装基板に回路素子を半田付けできる。

【0007】第2に、LCCパッケージと前記実装基板との接着は、低温硬化タイプの銀ペーストで成し、銀ペーストが塗布される実装基板の電極間には溝を形成して解決するものである。つまり乾燥固化前では、粘性が低いため、電極の周りを銀ペーストが広がりお互いがショートする可能性があるが、溝を電極間に形成するため、横方向に広がるペーストを溝の縦方向の側壁へ向かわせることができ、短絡を抑制することができる。

【0008】第3に、少なくとも一方の面に素子が収容できる溝が形成された実装基板を用意し、この実装基板の溝の中にセンサチップの駆動ICを実装し、センサチップ表面の電極と溝底部にある電極とをワイヤボンドし、この後、実装基板に回路素子を半田接着し、前記実装基板の溝を覆うように、前記センサチップが実装されたLCCパッケージを設けることで解決するものである。

【0009】ボンディングツールは、ボンディングヘッドとワイヤー供給部で鋭角な角部を有し、これが一体となって一定の高さでボンディングパッドへ近接してゆく。従って、実装基板上の回路素子がその軌跡上にあつたり、回路素子がワイヤーやその供給部にあつたりするとボンディングできないが、最初にペアチップを実装するため、その問題が無くなる。

#### 【0010】

【発明の実施の形態】図1は、本発明の固体撮像装置の構造を示す分解斜視図である。センサチップ51は、シリコン基板上に周知の半導体プロセスによって複数の受光画素及びシフトレジスタが形成されたものであり、複数の受光画素がマトリクス状に配列された受光面52を有する。

#### 【0011】

符号53は、前記センサチップ51を実装

4

するLCCパッケージであり、図7の枠部材が2枚用いられているものである。つまり底部材54、第1の枠部材55および第2の枠部材56で凹み部が形成されている。これらの要素は、セラミック基板、プリント基板等が考えられるが、ここではセラミック基板で以下進めてゆく。

【0012】底部材53は、セラミック基板の絶縁材料からなり、一方の面の中央部分にセンサチップ51が装着される。また、センサチップ51の周囲を含めて第1の開口部57が第1の枠部材55に形成され、この第1の開口部よりも大きな第2の開口部が第2の枠部材に設けられている。従って、第1の枠部材55の内側は、露出されており、ここには、周辺まで延在する複数のリード58が銅箔等の導電材料によって形成される。この複数のリード58は、中央部側の端部がセンサチップ51の周辺部分に入出力端子として形成される電極パッドとワイヤボンディングにより接続される。またセンサチップと第1の枠部材55の高さがほぼ等しく形成され、ボンダーのボンディング性を良好にしている。また底部材53、枠部材55、56が貼り合わされたパッケージの側面には、溝が形成され、前記リード58と電気的に接続され底部材の裏面に延在された電極が設けられている。

【0013】枠部材56の対向する2辺の内側には、一対の位置決め穴60が形成され、センサユニット61の内部に形成された凸部と位置合わせされる。図面では省略したが、透明板（アクリル樹脂等の可視光に対して透明な材料）が、枠部材56の開口部62の対向する2辺に跨るようにして枠部材56の表面に装着される。この透明板は、一方の辺の長さが、開口部62の一方の対向する2辺の幅より長く形成され、且つ、他方の辺の長さが、開口部62の他方の対向する2辺の幅より短く形成される。これにより、透明板を開口部62の対向する2辺の間に跨るように装着すると共に、開口部17の一部を開けた状態とする。そして、センサチップ51と透明板との間には、透明板と屈折率がほぼ同一の透明樹脂が充填され、センサチップ51等を保護している。

【0014】ここで、センサチップ51と透明板との間に充填される透明樹脂は、実際の製造工程では、センサチップ51を底部材54に装着した直後に枠部材56の開口部62で形成される凹部を埋めるように充填される。そして、透明樹脂が硬化する前に開口部62の対向する2辺の間に跨るようにして装着される。これにより、充填される透明樹脂が多かった場合には、開口部62の透明板で被われていない部分で盛り上がるため、透明板の浮き上がりは生じない。逆に、充填される透明樹脂が少なかった場合には、開口部62の透明板で被われていない部分でへこみが生じるため、センサチップ51の受光面52と透明板との間に気泡が混入することはない。

(4)

5

【0015】以上で簡単であるがLCCパッケージ53が完成される。これと並行して実装基板70には、ペアチップ65を取り込める溝66が形成され、必要によってこの溝に樹脂が充填されている。この溝は、本発明の特徴とするところであり、これについては後述する。この構成の実装基板70は、図2のようにチップ抵抗71、チップコンデンサ72、半導体IC（ここではセンサの駆動IC73）やコネクタC等が両面に実装されている。この両面実装された、一方の面にLCCパッケージ53が低温タイプの硬化剤により固着されている。ここでは、135度1時間で硬化される銀ペースト81が、LCCパッケージの電極と対応した所に設けられた電極80に塗布されている。

【0016】更には受光領域52に映像が結像されるように、レンズが組み込まれたセンサユニット61が実装基板70と一緒に組み立てられ、ちょうど点線で示された空間にLCCパッケージ53や回路素子等がくみこまれた形となっている。ここで、LCCパッケージが実装基板と低温硬化タイプの導電性接着剤で固着され、接着剤として低温135度1時間で硬化される銀ペーストを用いている。つまりセンサチップ51の熱的劣化も抑えられ、且つ実装基板70の半田が溶けて、実装基板の裏面、ここではIC73実装された面に実装された回路素子が落下することもないような硬化剤が選択されている。

【0017】続いて簡単に製造方法を説明する。先ず図3のように、多層配線で成り、回路素子が固着される電極が設けられた実装基板70に溝66を形成し、この溝にペアチップ65を接続する。金属細線67は、チップ表面の電極と溝に露出している電極とを電気的に接続し、実装基板の回路を構成している。そしてペアチップ65が実装されている表面に、183度の共晶半田がスクリーン印刷され、この上に回路素子がマウントされ、半田リフロー炉で半田付けされる。

【0018】続いて図4のように、実装基板が反転され、150度の低融点半田がスクリーン印刷され、この上に回路素子がマウントされ、半田リフロー炉で半田付けされる。この時下を向いている面の半田は、先に半田付けされた半田よりも高融点であるため、回路素子71、72の落下はない。更に図5のように、再度実装基板70を反転し、LCCパッケージ53を実装する。

【0019】以上説明したように、溝66の形成により、実装基板の実装効率を高めることができ、実装基板の小型化が実現できる。また最初にペアチップをワイヤーボンドするため、ボンディングツールの軌跡に制約が少ない。つまり実装側の基板に回路素子が実装されていないために、ボンディングツールが回路素子に到達することがない。

【0020】また図2の上面は、例えば183度の反対

(4)

6

の面よりも高融点の半田を用い、下面は、150度程度の低融点半田を用いている。従って銀ペーストの乾燥炉は、135度1時間の銀ペースト固化が行われ、両半田が融けることなくLCCパッケージ53を固着できる。また図6のような構造を採用しても良い。この図は、図1の実装基板に示す電極パターン80をしめすもので、ここでは4側辺に設けられている。しかし図1のように2側辺に設けていても良い。ここでは銀ペースト81が塗布され、LCCパッケージ53が電極80上に配置される。しかしLCCパッケージは、仮固定も考慮されて押圧され、銀ペーストが電極80、80の間に漏れ出す事があり、その結果ショートの原因となる。本発明では、点で示す部分に若干の溝82を形成し、溝の縦方向の長さを調整して設計することで、銀ペーストが溝の縦方向に流れるようにして、横方向の広がりを抑制してショートを防止している。

【0021】

【発明の効果】本発明によれば、第1に、LCCパッケージの実装領域に対応する実装基板に、溝を形成し、この溝に半導体ペアチップを実装することで、実装基板の実装効率を向上させ、また搬送中のペアチップへの接触を防止できる。第2に、LCCパッケージと前記実装基板との固着は、低温硬化タイプの銀ペーストで成し、銀ペーストが塗布される実装基板の電極間に溝を形成し、横方向に広がるペーストを溝の縦方向の側壁へ向かわせることができ、短絡を抑制することができる。

【0022】第3に、少なくとも一方の面に素子が収容できる溝が形成された実装基板を用意し、この実装基板の溝の中にセンサチップの駆動ICを実装し、センサチップ表面の電極と溝底部にある電極とをワイヤーボンドし、この後、実装基板に回路素子を半田固着し、前記実装基板の溝を覆うように、前記センサチップが実装されたLCCパッケージを設けることで、ボンディングツールのヘッドの軌跡を比較的自由に取れ、作業性を向上させることができる。

【図面の簡単な説明】

【図1】本発明の固体撮像装置の構造を示す分解斜視図である。

【図2】本発明の固体撮像装置の構造を示す断面図である。

【図3】本発明の固体撮像装置の製造方法を説明する断面図である。

【図4】本発明の固体撮像装置の製造方法を説明する断面図である。

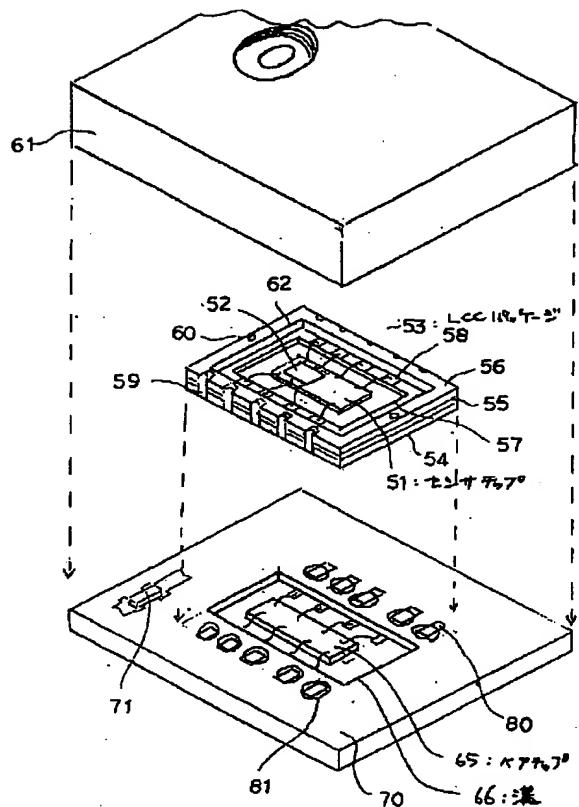
【図5】本発明の固体撮像装置の製造方法を説明する断面図である。

【図6】本発明の実装基板を説明する平面図である。

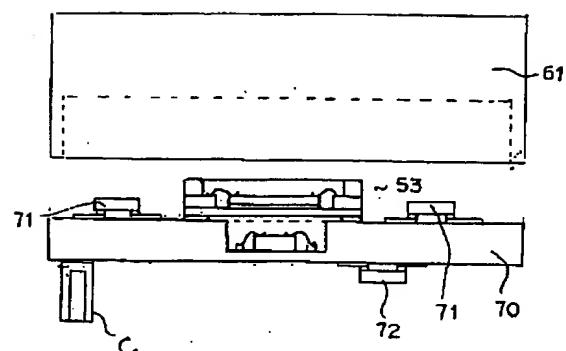
【図7】従来の固体撮像装置の実装方法を説明する分解斜視図である。

(5)

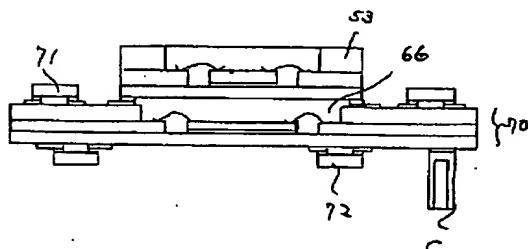
【図1】



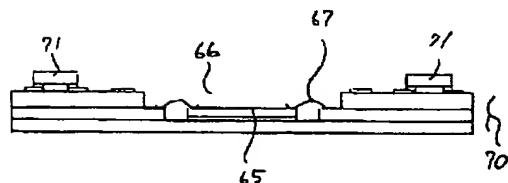
【図2】



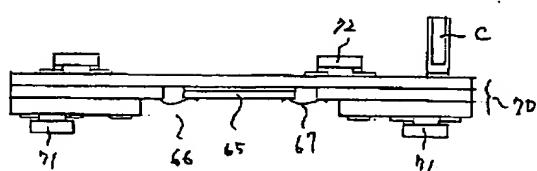
【図5】



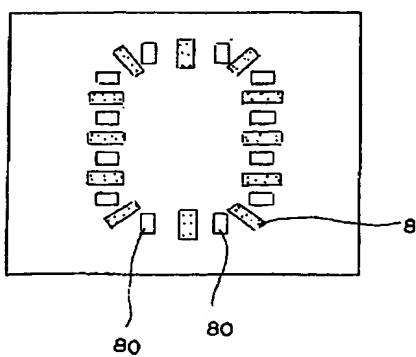
【図3】



【図4】



【図6】



(6)

【図7】

